Claims

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1. A process for the production of a synthetic low sulphur diesel fuel and a low soot emission aviation fuel from a Low Temperature Fischer-Tropsch (LTFT) feedstock, said process including the fractionation of the Low Temperature Fischer-Tropsch feedstock into a light kerosene fraction and a heavier diesel fraction in a volumetric ratio of between 1:2 and 5:4 to form the light kerosene fraction useable as a low soot emission aviation fuel and/or an aviation fuel blend stock, and the heavier diesel fraction useable as a synthetic low sulphur diesel fuel and/or a diesel fuel blend stock, said fractions substantially complying with diesel and aviation fuel specifications.

- 2. A process as claimed in claim 1, wherein at least 33 volume% of the LTFT feedstock is separated to form said aviation fuel or blending stock having a final boiling point of about 270°C.
- 3. A process as claimed in claim 1 or claim 2, wherein the process includes fractionation and removal of 45 volume%, or even 55 volume% of the feedstock to form said aviation fuel or blending stock.

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- 4. A synthetic aviation fuel or fuel blend stock for a semi-synthetic aviation fuel, said aviation fuel or blend stock being produced by a process as claimed in any one of claims 1 to 3 and having the following properties:
- from 13 mass% to 17 mass% hydrogen;
- 25 iso:n-paraffins mass ratio of 0.5 to 3;
 - BOCLE lubricity wear scar less than 0.85mm; and
 - oxygen as oxygenates less than 50 ppm, typically less than about 10 ppm; of which
 - oxygen as primary C7 C12 alcohols is less than 50 ppm, typically less than about 10 ppm; and
 - oxygen as primary C12 C24 alcohols is less than 50 ppm,
 typically less than about 10 ppm.

5. A synthetic aviation fuel or fuel blend stock as claimed in claim 4, having less than 0.1%m/m aromatics.

- 6. A synthetic aviation fuel or fuel blend stock as claimed in claim 4 or claim5, having a smoke point greater than 50mm.
 - 7. A synthetic aviation fuel or fuel blend stock as claimed in any one of claims 4 to 6, having a density@20°C about 0.75 kg/l.

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- 8. A synthetic aviation fuel or fuel blend stock as claimed in any one of claims 4 to 7, having a freezing point of below -47°C;
- 9. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 8, wherein the iso:n paraffins mass ratio is from 1 to 2.
 - 10. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 8, wherein the iso:n paraffins mass ratio is from 1.16 to 1.2.
- 20 11. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 10, wherein the hydrogen is about 15 mass%.
 - 12. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 11 which is a LTFT kerosene fraction.
 - 13. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 12, wherein the blend stock has a viscosity@-20°C of less than 8cSt.
- 14. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 13, which has a final boiling point of above 200°C, typically about 270°C.

15. A semi-synthetic aviation fuel including from 0.1 mass% to 99.9 mass% of a blending stock as claimed in any one of claims 4 to 14, said semi-synthetic aviation fuel having:

- 5 iso:n-paraffins ratio of 0.5 to 3;
 - Smoke point greater than 35mm; and
 - at least 8%m/m aromatics.

- 16. A semi-synthetic aviation fuel as claimed in claim 15, having a 10 density@15°C of at least 0.775 kg/l.
 - 17. A semi-synthetic aviation fuel as claimed in claim 15 or claim 16, having a smoke point greater than 35mm.
- 15 18. A semi-synthetic aviation fuel as claimed in any one of claims 15 to 17, having a freezing point of below -47°C;
 - 19. A semi-synthetic aviation fuel as claimed in any one of claims 15 to 18, having an iso:n paraffins mass ratio of from 1 to 2.
 - 20. A semi-synthetic aviation fuel as claimed in claim 19, wherein the iso:n paraffins mass ratio is 1.8.
- 21. A semi-synthetic aviation fuel as claimed in any one of claims 15 to 20, including 50 vol% of the blending stock, wherein the blending stock is LTFT kerosene, and 50 volume% crude oil derived sweetened and severely hydrotreated kerosene.
- 22. A thermally stable aviation fuel with low deposition tendency when combusted, said fuel including one or more fuel selected from a synthetic aviation fuel, and a synthetic aviation fuel blend stock as claimed in any one of

claims 4 to 14, and a semi-synthetic aviation fuel as claimed in any one of claims 15 to 21, said thermally stable aviation fuel having a thermal stability tube deposit rating at 260°C of less than 1.

- 5 23. A thermally stable aviation fuel as claimed in claim 22, having Quartz Crystal Microbalance (QCM) deposition of less than 3 μg/cm².
 - 24. A thermally stable aviation fuel as claimed in claim 22 or claim 23, having QCM deposition of less than 2 $\mu g/cm^2$ for a 15h QCM test @ 140°C without addition of an anti-oxidant.
 - 25. A synthetic low sulphur fuel or blend stock for a low sulphur fuel produced by the process of any one of claims 1 to 3, said fuel or blend stock having the following properties:
- 15 from 13 mass% to 17 mass% hydrogen;
 - iso:n-paraffins mass ratio of from 2 to 5
 - less than 0.1%m/m aromatics;

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- CFPP according to IP309 of below -5°C;
- density@20°C of at least 0.780 kg/l; and
- 20 total oxygen content less than 80 ppm.
 - 26. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in claim 25, wherein the iso:n paraffins mass ratio is from 3 to 4.
 - 27. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in claim 26, wherein the iso:n paraffins mass ratio is 3.7.
- 28. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 27, wherein the hydrogen is about 15 mass%.

29. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 28, wherein the CFPP is below -9°C.

- 30. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 29, wherein the fuel or blend stock is a LTFT diesel fraction.
 - 31. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 30, which has a viscosity@40°C of above 2cSt.
 - 32. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 31, which has a final boiling point of above 330°C.
 - 33. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 32, which has an IBP of above 200°C.
- 34. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 33, which has an IBP above 250°C.
 - 35. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 33, which has an IBP above 265°C.
- 25 36. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 33 to 35, which when combusted in a compression ignition engine produces substantially an equivalent amount of particulate emissions as a European EN590 reference diesel fuel when combusted under the same conditions in the same engine.

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